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RAIL SHIPPING TESTS WITH LONG ISLAND CAULIFLOWER - 1951

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RAIL SHIPPING TESTS WITH LONG ISLAND CAULIFLOWER - 1951

Introduction

This report [1] summarizes the results of two rail shipping tests with Long Island cauliflower made during October, 1951, from Riverhead, New York. Each test was comprised of two commercial carlots. The work was a continuation of that conducted during the previous season [2], and was carried out with the cooperation of the Long Island Cauliflower Distributors.

The purpose of the tests was to determine whether the use of either 10,000 or 15,000 pounds of top ice would provide sufficient refrigeration for shipments destined for mid-western markets.

Methods

The 381-crate load was used in all cars. This load is a non-stripped "through" load consisting of (1) 15 stacks in which the crates are placed on their sides lengthwise of the car, six rows wide and four layers high; and (2) a sixteenth stack at one end of the car in which the crates are placed on end, seven rows wide and three layers high. The Long Island wirebound crate was used in all tests.

The general plan for each test was to load and ship two cars under as nearly identical conditions as possible except for the variation in method of refrigeration (and/or car type) under comparison.

During the loading operations half of each truckload from the field was placed in one car and half in the other car; this was repeated until loading was completed. The contents of the two cars were thus nearly identical. Unless indicated otherwise, both cars of a test were shipped together to the same market.

On the day of loading, two cars as nearly alike in general condition as could be found on the siding were selected and prepared for the test by attaching the electric resistance thermometer equipment to the ceiling of the car. The lead from the cable was passed out of the car by means of the door plate so that temperatures within the car could be read after the doors had been closed. During loading, which usually lasted about an hour, the electric resistance thermometers were inserted into the center of cauliflower heads in crates located respectively in the bottom layer, the next to the bottom layer (head in upper part of crate), and the top layer at (1) bunker, (2) quarterlength, and (3) doorway positions at the centerline of the car. Opportunity was thus afforded for obtaining commodity temperatures at nine representative locations in the load. By means of three other electric resistance thermometers air temperatures were obtained at bottom bunker, bottom doorway and top doorway positions at centerline of car. Continuous records

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[1] Part of a Research and Marketing Act project (RM:a-165) on the handling, distribution and marketing of vegetables in the northeastern states.

[2] Kaufman, J., Hruschka, H. W., and Wiant, James S. Rail Shipping Tests with Long Island Cauliflower - 1950. U. S. Dept. Agr., H. T. & S. Office Report No. 259, 1951. (Processed).

of transit temperatures at two quarterlength centerline positions in the load were obtained with recording thermometers placed in the center of test packages. A recording thermometer was also attached to the underframe of each car in order to obtain a continuous record of outside air temperatures. None of the bulkhead openings of the bunkers were papered.

Temperature records were taken periodically with the resistance thermometer equipment from the time loading was completed until the time the cars were moved from the siding just prior to shipment. Temperature readings were also taken on the day after shipment while the cars were en route through the New York City area. All cars were met at destination by an observer who again made temperature readings and inspected the arrival condition of the load and of the cauliflower. Inspections at destination were also made by U. S. Department of Agriculture P.M.A. inspectors and by representatives of the railroad inspection agencies.

Results

Cars 1 and 2: Comparison in non-fan cars between the use of 10,000 pounds of top ice and 15,000 pounds of top ice.

Both cars were loaded at Riverhead on the afternoon of October 26 and shipped together that night for Fort Wayne, Indiana, via L.I.R.R., L.V.R.R., and N.K.P.R.R. They arrived at their destination on October 30 and were unloaded on October 31.

Car 1 was top iced with 10,000 pounds of crushed ice. On arrival approximately 50 pounds of top ice remained. The upper surfaces of the crates, however, were still damp. Though the upper layers were out of row alignment, leaning toward the side walls, all of the crates arrived in good condition.

Car 2 top iced with 15,000 pounds of crushed ice, contained on arrival an estimated 4,000 pounds of top ice which covered the load with a layer of ice 4 to 7 inches thick. Neither car was re-iced in transit. No bunker ice was used.

The cauliflower, when loaded into cars 1 and 2, was considered to be of fairly good quality. The jacket leaves were generally fresh and green. Some, however, showed yellowing and spotting (Alternaria leaf spot), with spots 1 to 2 inches in diameter. The curds, which were mostly white, were free from decay. The condition of the cauliflower upon arrival was essentially the same as when it was loaded into the cars at shipping point. The leaves remained generally fresh and green and the curds white.

The outside air temperatures at the time of loading ranged from 63° to 66°, and during transit were relatively cool, ranging from 38° to 73°, and averaged approximately 53°. The commodity temperature ranged from 53° to 57° F., and averaged 55° at time of loading.

From the data in tables 1 and 2 it can be seen that from the time the cars were iced until the last reading was made at Riverhead 7 hours later there were no appreciable differences in commodity temperatures between the two cars. Middle layers of car 2 were 1 to 2 degrees cooler than in car 1, but 2 to 5 degrees warmer in the bottom layers of car 2 than in car 1. During the following four days

top and middle layer temperatures were 3 to 6 degrees cooler and average commodity temperatures 2 to 4 degrees cooler in heavily iced car 2 than in car 1. (See fig. 1)

Ryan thermograph records (table 5) indicate that at two quarterlength positions, temperatures during most of the transit period were a few degrees cooler in car 2 (15,000 pounds top ice) than in car 1.

Cars 3 and 4: Comparison in fan cars between the use of 10,000 pounds of top ice and 15,000 pounds of top ice.

Both cars were loaded at Riverhead on the afternoon of October 26 and shipped together that night to Chicago, Illinois, via L.I.R.R. and B.&O.R.R. They arrived at destination October 30, at which time they were unloaded.

Car 3 was top iced with 10,000 pounds of snow ice. On arrival approximately 500 pounds of ice remained in small mounds scattered over the top of the load.

Car 4 was top iced with 15,000 pounds. On arrival at Chicago approximately 5,000 pounds remained, covering the load 4 to 5 inches at quarterlength position and 12 to 14 inches at the doorway position.

Neither car was re-iced in transit. No bunker ice was used.

The cauliflower when loaded into cars 3 and 4 was mostly of good quality. The jacket leaves were fresh and generally of good green appearance. The curds were compact, white to creamy-white. Some of the heads, however, were wormy. The worm injury marred the appearance of the commodity in some of the crates. On arrival the jacket leaves were generally fresh and green, and the curds white to creamy-white. No significant changes in condition were noted which could be attributed to different amounts of top ice used.

The outside air temperatures at the time of loading ranged from 63° to 66°. The commodity temperature ranged from 53° to 59°, averaging approximately 56° F. The outside air temperature during transit ranged from 32° to 72°, averaging approximately 55° F.

During the time the two cars were on track at Riverhead (tables 3 and 4) the average commodity temperatures of both cars were approximately the same, except that the 5:30 p.m. average for car 3 was 3 degrees lower than that of car 4, having been top iced 35 minutes earlier than car 4. (See also fig. 2)

By the time the cars reached Chicago the commodity temperatures were very uniform in both cars, ranging from 33 to 35° F.

From table 5 (recording thermometer temperatures) it will be seen that temperatures at two quarterlength positions were several degrees lower during most of the transit period in car 4 receiving the greater amount of top ice.

Discussion and Commercial Applications

Only limited conclusions can be drawn from the two tests conducted. In both tests the commodity temperature was relatively cool at the time of loading

(55° to 56° F.) and the cars moved to destination under an average mean daily temperature of 53° to 55°. Under these circumstances the cauliflower carried well in both cars that received only 10,000 pounds of top ice.

The commodity temperatures in the fan cars at arrival in Chicago four days after the date of shipment were essentially the same regardless of the amount of top ice initially applied. Approximately 10,000 pounds of ice was melted in each car.

In the non-fan cars unloaded at Fort Wayne five days after the time of shipment commodity temperatures were definitely lower in the car receiving the greater amount of top ice. Practically no ice remained in the car initially iced with only 10,000 pounds.

It would appear that the use of only 10,000 pounds of top ice offers very little margin of safety for shipments destined for mid-western markets. This would be particularly true for warmer shipments than those of the present test, or in case of unscheduled delay en route.

The use of 15,000 pounds of top ice was wholly satisfactory under the conditions of the present tests. In fact, with nearly a third of the ice still remaining at destination it would appear that the amount initiallyapplied was in excess of actual requirements. Again it should be pointed out that this would probably not hold true for shipments made during very warm weather, or in the event of delays en route.

Acknowledgments

Grateful acknowledgment is made to the following:

Mr. A.Denholz, Long Island Cauliflower Distributors, Riverhead, New York.
The Fruit Growers Express Company
Mr. F. A. Piehl,Western Weighing Inspection Bureau, Chicago, Ill.
The Railroad Perishable Inspection Agency
The Kroger Company, Fort Wayne, Ind.
Lapidus & Sons, Chicago, Ill.
Mr. W. A.Radspinner, U. S. Department of Agriculture, New York City.
Mr. W. R. Wright, U. S. Department of Agriculture, Chicago, Ill.

Table 1. Summary of temperatures obtained with resistance thermometers in Car 1.
Non-fan car shipped with 10,000 pounds of top ice only.

			Air Temp. (° F.) [1]				Commodity Temperatures (° F.) [1]												
Station	Date	Time	OST	BB	BD	TD	TB	MB	BB	TQ	MQ	BQ	TD	MD	BD	Av. Top	Av. Mid.	Av. Bot.	Av. Car
Riverhead	10/26	3:30p	Loading completed.																
"	"	3:35p	63	58	61	68	55	54	55	56	57	55	54	54	54	55	55	55	55
"	"	4:25p	Top iced.																
"	"	4:30p	60	38	48	38	50	52	51	55	51	51	54	54	51	53	52	51	52
"	"	5:00p	55	32	43	51	47	51	47	53	49	48	54	53	48	51	51	48	50
"	"	5:30p	48	36	41	50	46	41	46	53	49	46	54	53	47	51	51	46	49
"	"	6:00p	45	38	41	49	45	50	45	53	49	46	54	53	47	51	51	46	49
"	"	7:00p	43	35	37	47	43	48	42	52	48	42	54	52	46	50	49	43	47
"	"	8:00p	43	34	36	46	41	46	41	51	48	41	53	51	44	48	48	42	46
"	"	9:00p	47	34	35	45	41	45	40	51	47	40	53	50	44	48	47	41	46
"	"	10:30p	55	33	35	44	40	44	39	51	47	39	52	49	43	48	47	40	45
N.Y.C.	10/27	4:50p	68	33	33	48	37	37	34	42	44	34	44	41	38	41	41	35	39
Ft.Wayne	10/30	7:15p	56	33	33	48	40	38	33	40	42	33	41	39	35	40	40	34	38
"	10/31	7:45a	38	32	32	45	42	39	32	41	42	32	42	39	35	42	40	33	38
"	"	1:15p	47	32	33	48	43	39	33	41	43	33	43	39	35	42	40	34	39

[1] All temperatures taken in centerline of car.
Position: B = bunker, Q = quarterlength, D = doorway.
Layers: B = bottom, M = middle (top of second layer of four), T = top.
OST = outside air temperature.

Table 2. Summary of temperatures obtained with resistance thermometers in Car 2.
Non-fan car shipped with 15,000 pounds of top ice only.

				Air Temp. (° F.) [1]			Commodity Temperatures (° F.) [1]												
Station	Date	Time	OST	BB	BD	TD	TB	MD	BB	TQ	MQ	BQ	TD	MD	BD	Av. Top	Av. Mid.	Av. Bot.	Av. Car
Riverhead	10/26	3:35p		Loading completed.															
"	"	3:40p	63	58	60	66	56	54	53	57	55	56	54	54	53	56	54	54	55
"	"	4:15p		Top iced.															
"	"	4:20p	60	52	39	46	52	52	52	55	54	53	52	53	53	53	53	53	53
"	"	5:00p	55	47	40	47	49	49	50	54	51	50	54	51	50	52	50	50	51
"	"	5:30p	47	46	43	47	48	49	51	53	51	50	49	51	50	50	50	50	50
"	"	6:00p	45	44	38	46	47	48	50	52	50	49	48	50	49	49	49	49	49
"	"	7:00p	43	42	36	43	45	46	48	51	48	47	47	49	47	48	48	47	48
"	"	8:00p	43	40	35	43	44	45	48	51	47	46	46	48	46	47	46	47	47
"	"	9:00p	47	39	34	41	42	44	47	50	46	45	45	47	44	46	46	45	46
"	"	10:30p	55	39	34	40	41	43	47	49	46	44	44	47	44	45	45	45	45
N.Y.C.	10/27	4:45p	68	35	33	42	36	36	37	40	37	37	36	39	37	37	37	37	37
Ft.Wayne	10/30	7:15p	56	34	33	39	38	34	35	37	35	34	35	34	34	37	34	34	35
"	10/31	7:45a	38	33	32	36	38	34	33	36	34	33	35	34	33	36	34	33	34
"	"	1:15p	47	33	32	40	38	35	33	36	34	33	35	35	33	36	35	33	35

[1] All temperatures taken in centerline of car.
Position: B = bunker, Q = quarterlength, D = doorway.
Layers: B = bottom, M = middle (top of second layer of four), T = top.
OST = Outside air temperature.

Table 3. Summary of temperatures obtained with resistance thermometers in car 3.
Fan car shipped with 10,000 pounds of top ice only.

				Air Temp. 1/ (° F.)			Commodity Temperatures 1/ (° F.)												
Station	Date	Time	OST	BB	BD	TD	TB	MB	BB	TQ	MQ	BQ	TD	MD	BD	2/ Av. Top	Av. Mid.	Av. Bot.	Av. Car
Riverhead	10/26	3:25p		Loading completed.															
"	"	3:30p	63	59	62	68	58	55	55	56	55	56	56	57	55	57	56	55	56
"	"	4:55p		Top iced.															
"	"	5:30p	48	43	33	49	-	53	53	49	50	51	48	54	53	49	52	52	51
"	"	6:00p	45	43	34	47	-	53	53	48	49	50	47	54	51	48	52	51	51
"	"	7:00p	45	41	35	44	-	52	51	46	47	49	47	52	50	47	50	50	49
"	"	8:00p	43	41	34	44	-	52	50	46	46	48	45	52	49	46	50	49	49
"	"	9:00p	47	41	34	42	-	51	49	44	44	47	44	52	48	44	49	48	47
"	"	10:30p	55	39	33	41	-	51	48	43	43	46	43	51	47	43	48	47	47
N.Y.C.	10/27	2:00p	69	34	33	40	-	38	36	36	35	34	35	40	40	36	38	36	37
Chicago	10/30	1:00a	47	34	34	36	-	35	34	34	34	33	35	35	34	35	35	34	34
"	"	10:00a	49	34	33	33	-	35	34	34	35	36	36	35	34	35	35	35	35

1/ All temperatures taken in centerline of car.
Position: B = bunker, Q = quarterlength, D = doorway.
Layers: B = bottom, M = middle (top of second layer of four), T = top.
OST = outside air temperature.

2/ Averages based on top quarterlength and top doorway positions only.

Table 4. Summary of temperatures obtained with resistance thermometers in Car 4.
Fan car shipped with 15,000 pounds of top ice only.

				Air Temp. 1/ (° F.)			Commodity Temperatures (° F.) 1/												
Station	Date	Time	OST	BB	BD	TD	TB	MB	BB	TQ	MQ	BQ	TD	MD	BD	Av. Top	Av. Mid.	Av. Bot.	Av. Car
Riverhead	10/26	3:00p		Loading completed.															
"	"	3:30p	63	58	62	67	58	54	53	57	55	56	57	56	59	57	55	56	56
"	"	5:25p		Top iced.															
"	"	5:30p	48	52	49	33	55	54	51	54	55	56	55	55	49	55	55	52	54
"	"	6:00p	45	51	43	39	51	54	52	51	55	54	53	49	46	52	53	51	52
"	"	7:00p	45	44	39	41	48	54	51	48	55	51	51	47	43	49	52	48	50
"	"	8:00p	43	48	38	42	47	54	51	47	55	51	50	46	42	48	52	48	49
"	"	9:00p	47	47	36	41	46	53	51	46	54	49	49	46	41	47	51	47	48
"	"	10:30p	55	46	35	40	45	54	51	44	55	48	47	44	39	45	51	46	47
N.Y.C.	10/27	1:45p	69	35	34	42	37	45	39	37	45	41	37	37	35	37	42	38	39
Chicago	10/30	1:00a	47	33	32	35	34	35	34	34	35	35	33	33	33	34	34	34	34
"	"	10:00a	49	34	32	38	34	35	34	34	35	35	33	33	33	34	34	34	34

[1] All temperatures taken in centerline of car.
Position: B = bunker, Q = quarterline, D = doorway.
Layers: B = bottom, M = middle (top of second layer of four), T = top.
OST = outside air temperature.

Table 5. Transit temperatures obtained with Ryan recording thermometers, October, 1951.

Car No.	Date shipped	Location of Ryan in load (layer)[1]	Temperature (° F.) at twelve-hour intervals. Start[2]	12	24	36	48	60	72	84	96	108	120
		Non-fan car, 10,000 pounds top ice only, to Fort Wayne											
1	10/26	1	58	44	39	38	36	36	36	36	35	35	35
		3	56	49	43	42	41	41	40	40	40	41	41
		Non-fan car, 15,000 pounds top ice only, to Fort Wayne											
2	10/26	1	62	43	37	35	34	33	32	32	32	32	32
		3	58	40	40	38	37	36	36	36	35	34	34
		Fan car, 10,000 pounds top ice only, to Chicago											
3	10/26	1	61	41	38	37	36	36	36	36	36		
		3	59	43	40	39	38	37	36	37	37		
		Fan car, 15,000 pounds top ice only, to Chicago											
4	10/26	1	58	42	40	36	34	34	34	34	34		
		3	60	44	41	37	35	34	34	34	34		

[1] 1 = bottom layer; 3 = next to the top layer. All Ryans located at quarterlength, centerline of car.

[2] Start = time the cauliflower crates with Ryan recording thermometers were placed in position inside the car.

Figure 1

Average car temperatures in transit.
Car 1 - 10,000 lbs. top ice
Car 2 - 15,000 lbs. top ice

(Non-fan cars)

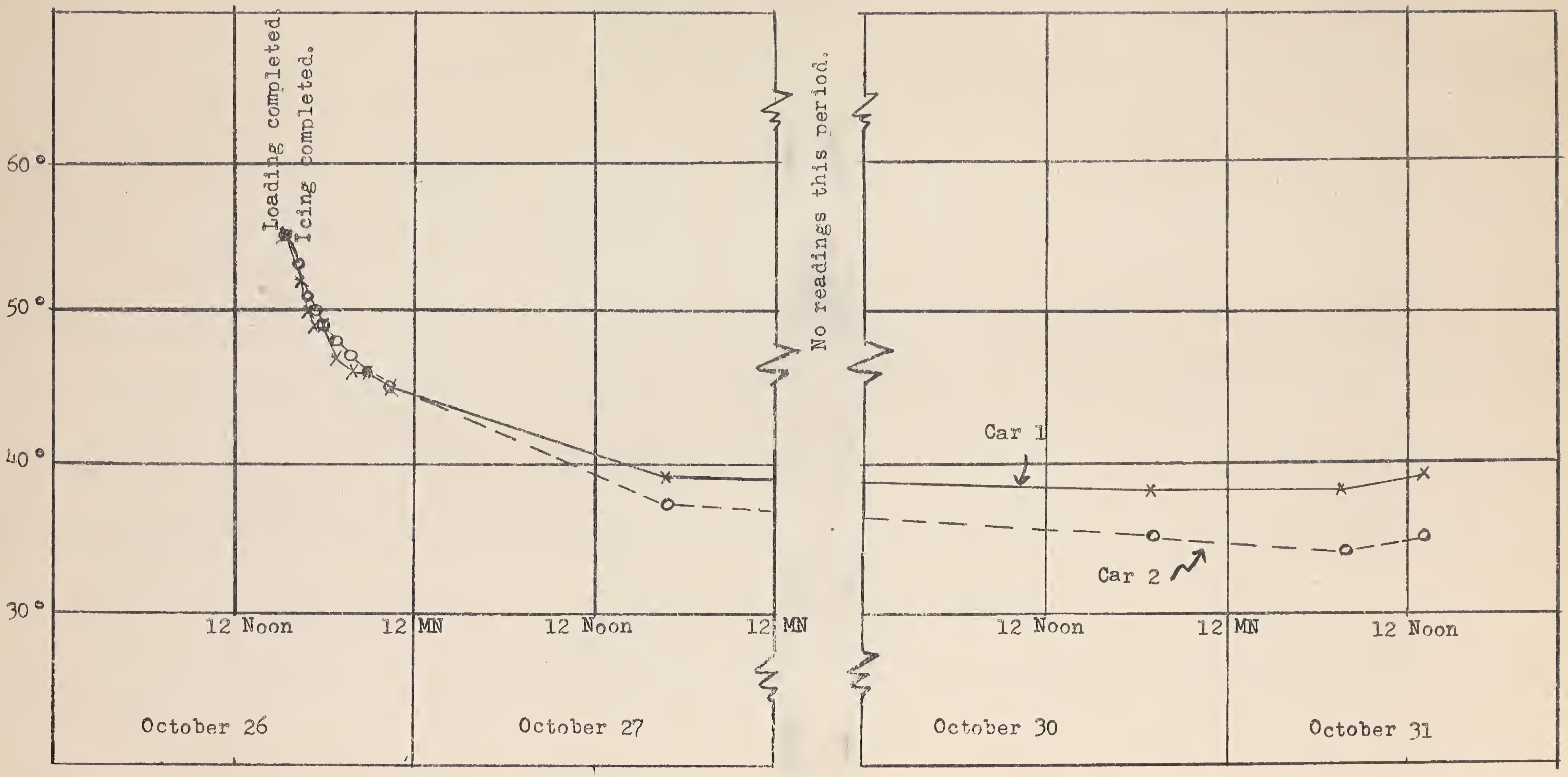

Figure 2
Average car temperatures in transit
Car 3 - 10,000 lbs. top ice
Car 4 - 15,000 lbs. top ice
(Fan cars - fans on)